Fall in Antibody Titer to Bovine Leukemia Virus in the Periparturient Period

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ABSTRACT

Twenty-seven cows with antibodies to bovine leukemia virus were bled before, during and after calving. All serum samples were tested quantitatively for bovine leukemia virus antibodies using both the agar-gel immunodiffusion test with a glycoprotein antigen and the radioimmunoprecipitation assay with an internal p24 protein antigen. A significant fall ($P < 0.001$) in bovine leukemia virus-antibody titer was demonstrated with both tests at the time of calving, with a subsequent rise in antibody titer within one month of parturition. Bovine leukemia virus antibodies were not detectable using the agar-gel immunodiffusion test in two of these cows at the time of calving.

RÉSUMÉ

Cette expérience impliquait 27 vaches qui possédaient des anticorps sériques à l'endroit du virus de la leucémie bovine et chez lesquelles on préleva un échantillon de sang, avant, pendant et après le vêlage. On procéda ensuite à la recherche quantitative de ces anticorps dans tous les échantillons prélevés à cette fin, en utilisant la réaction de précipitation en milieu gélifié et celle de radioimmunoprécipitation. On constata, avec les deux épreuves, une baisse appréciable ($P < 0,001$) du taux d'anticorps sériques contre le virus de la leucémie bovine, au moment du vêlage; on démontra par ailleurs une augmentation de ces anticorps, au cours du mois suivant. La réaction de précipitation en milieu gélifié ne permit pas de déceler ces anticorps, au moment du vêlage, chez deux des vaches expérimentales.

INTRODUCTION

Bovine leukemia virus (BLV) infection is an important constraint to the export of cattle from Canada (10) and the United States (7,8). The standard serological test used in North America to diagnose BLV infection is the agar-gel immunodiffusion test (7,9). During studies on the natural transmission of BLV, it was noticed that variations in BLV-antibody titer to this test occurred around the time of calving, and that those variations could influence interpretation of the results of the test. This report describes a study designed to examine variations in BLV-antibody titer during the periparturient period.

MATERIALS AND METHODS

The cattle studied were cows from the University of Florida Dairy Research Unit herd. This herd is heavily infected with BLV, having been shown to have an annual BLV-antibody prevalence of over 75% in adult cattle (3). Twenty-seven cows (15 Holstein and 12 Jersey) were selected randomly from the pregnant cows which were positive for BLV antibodies. Each animal was bled for serum collection on three occasions: precalving at eight months postconception, at calving and one month after calving.

Each serum sample was tested for BLV antibodies using two serological tests. Firstly, the agar-gel immunodiffusion test (AGIT) with a glycoprotein antigen was used according to the method described by Burridge *et al* (3). Each positive sample was titrated to its endpoint using doubling dilutions from 1:2. Secondly, the radioimmunoprecipitation assay (RIA) with an internal p24 protein antigen was used according to the method described by Devare *et al* (4), with modifications to increase test sensitivity (11).

The serological data were examined statistically using the two-way analysis of variance procedure. The two factors considered in the analysis were cow and timing of serum collection, and the response variable was the log transformation of the reciprocal BLV-antibody titer.

RESULTS

The serological results are

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TABLE I. Geometric Mean Antibody Titers to Bovine Leukemia Virus (BLV) during Periparturient Period

Test	Reciprocal geometric mean BLV-antibody titer (range)		
	Precalving sample	Calving sample	Postcalving sample
AGIT	7.6 (2-32)	3.0 (0-16)	6.2 (1-64)
RIA	401.8 (49-1320)	159.3 (21-820)	353.5 (54-1500)

AGIT = Agar-gel immunodiffusion test with glycoprotein antigen
RIA = Radioimmunoprecipitation assay with internal protein antigen
Precalving sample taken eight months postconception and postcalving sample taken one month after calving

summarized in Table I, showing a marked fall in mean BLV-antibody titer in both the AGIT and RIA at the time of calving. The fall in AGIT and RIA antibody titers at calving was statistically significant ($P < 0.001$) for both Holstein and Jersey cows. Twelve (44%) of the 27 cows showed a two to three dilution drop in BLV antibody titer to the AGIT between the precalving and calving serum samples, and all but one of these animals demonstrated a subsequent rise in antibody titer within one month of calving. Two of these cows had no reaction to the AGIT at calving, and a further six showed only a weak reaction that was not detectable upon dilution of the sera to 1:2. the two cows seronegative on the AGIT had RIA titers of 1:26 and 1:40, while the six cows with AGIT titers of 1:1 had titers ranging from 1:21 to 1:85 to the RIA. There was a significant correlation ($r = 0.65$; $P < 0.01$) between the AGIT and RIA antibody titers.

DISCUSSION

The results demonstrate that during the periparturient period the BLV-antibody titers to both the glycoprotein and p24 antigens can fall markedly in some seropositive cows. It has been shown that serum levels of IgG_1 and IgM in cows are depressed around the time of calving (12), and that the amount of IgG_1 present in the colostrum at parturition is approximately equal to the amount that disappears from the circulation during colostrum formation (5,6). Therefore, it is probable that the fall in BLV-antibody titer in bovine serum around calving is associated with the transfer of BLV antibodies to colostrum.

The practical significance of this finding is in the interpretation and use of the AGIT for the diagnosis of BLV infection. It is evident from our results and from those of Bause *et al* (1,2) that cows with low BLV-antibody titers can test negative to the AGIT around calving. It is important, therefore, that cattle seronegative to the AGIT during the periparturient period should be retested at least one month after calving before being certified free of BLV infection.

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